UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/799,361	03/12/2004	Trung T. Doan	009001 AGS/IBSS	6366

61285 7590 07/25/2007

JANAH & ASSOCIATES, P.C.
650 DELANCEY STREET, SUITE 106
SAN FRANCISCO, CA 94107

EXAMINER	
BAND, MICHAEL A	

ART UNIT	PAPER NUMBER
1753	

MAIL DATE	DELIVERY MODE
07/25/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/799,361	DOAN ET AL.	
	Examiner	Art Unit	
	Michael Band	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) *41-49* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :3/12/2004; 4/22/2004; 10/27/2005; 6/2/2006.

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-40, drawn to a method of electrical arcing, classified in class 204, subclass 178.

   II. Claims 41-43, drawn to a method of casting, classified in class 29, subclass 148.

   III. Claims 44-46, drawn to a method of pressing, classified in class 164, subclass 3.

   IV. Claims 47-49, drawn to a method of friction welding, classified in class 228, subclass 112.1.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group I relates to a method of electrical arcing metal particles into gaps and Group II relates to a method of casting by liquefying the metal and dripping into gaps. Furthermore, the

inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

3. Inventions I and III are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group I relates to a method of electrical arcing metal particles into gaps and Group III relates to a method of using pressure to press mold the metal into gaps. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

4. Inventions I and IV are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group I relates to a method of electrical arcing metal particles into gaps and Group IV relates to a method of friction welding a piece of metal into gaps. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

5. Inventions II and III are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group II relates to a method of casting by liquefying the metal and dripping into gaps and Group III relates to a method of using pressure to press mold the metal into gaps. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

6. Inventions II and IV are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group II relates to a method of casting by liquefying the metal and dripping into gaps and Group IV relates to a method of friction welding a piece of metal into gaps. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

7. Inventions III and IV are directed to related processes. The related inventions are distinct if the (1) the inventions as claimed are either not capable of use together or can

have a materially different design, mode of operation, function, or effect; (2) the inventions do not overlap in scope, i.e., are mutually exclusive; and (3) the inventions as claimed are not obvious variants. See MPEP § 806.05(j). In the instant case, the inventions as claimed have materially different modes of operation where Group III relates to a method of using pressure to press mold the metal into gaps and Group IV relates to a method of friction welding a piece of metal in to gaps. Furthermore, the inventions as claimed do not encompass overlapping subject matter and there is nothing of record to show them to be obvious variants.

8. Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art due to their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

9. During a telephone conversation with Ashok Janah on June 25, 2007 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-40. Affirmation of this election must be made by applicant in replying to this Office action. Claims 41-49 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

10. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim

remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Information Disclosure Statement

11. The information disclosure statement filed June 2, 2006 cites an "International Search Report mailed May 12, 2006" as non-patent literature. Said citation has been lined-through because it is not a published document available to the public. However, the Examiner has considered the search report.

Claim Objections

12. Claim 18 is objected to because of the following informalities: Claim 18 reads "exposing the surface the target". Appropriate correction is required.

Claim Rejections - 35 USC § 112

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claims 10-11 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant claims a coating comprising chalcogenide material comprising germanium, selenium, and tellurium. Chalcogens are

part of Group 16 (oxygen, sulfur, selenium, tellurium, polonium, and ununhexium) of the Periodic Table. Germanium is not classified as a chalcogen.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. Claims 1, 3-7, 12-14, 18-20, 24, 26-28, 30-32, 34-36, 38-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Vukanovic et al (US Patent No. 4,505,947).

With respect to claims 1 and 12, Vukanovic '947 discloses a method for the deposition of coatings upon substrates (i.e. targets) utilizing arc plasma (i.e. electrical arcing) (abstract), where one embodiment of the invention of coated substrates are prepared by establishing electric field conditions in which an arc plasma may exists between a first electrode and a second electrode (col. 2, lines 63-68). Vukanovic '947 further discloses that the coating material may be placed on or in a cathode, where it is vaporized by the heat of the cathode and carried into the plasma region by a carrier gas (col. 4, lines 4-9). Vukanovic '947 describes how the coating materials are introduced into the region of the electrodes in a condensed state, such as a wire and volatized by the heat generated at or on the cathode (col. 4, lines 15-19) and if conductive (i.e. metal) as a sacrificial (i.e. consumable) cathode (col. 4, lines 19-22). Vukanovic '947 lists suitable coating materials as metals (col. 4, lines 25-33). Vukanovic '947 also

describes how the plasma material is introduced into the arc plasma and positioning a substrate material proximate to the arc plasma, whereby said coating material formed by the arc plasma contact the substrate to form a coating (col. 3, lines 8-13). It is well known that for a solid to be vaporized, the solid transitions from a solid state to a liquid state, thus the metal is liquefied. Furthermore, Vukanovic '947 discusses that "the types and proportions of the materials introduced into the region of the electrodes can be modified during the deposition process in order that discrete or graded layers of p, i and n material (as termed in the art) can be successively deposited, in any order" (col. 4, lines 52-57), thus the process is repeated to form a plurality of metal layers (p, i, and n).

With respect to claim 3, Vukanovic '947 further depicts figure 4 with an anode and a cathode (i.e. two electrodes) (parts 11 and 12), where the cathode is a sacrificial cathode (col. 4, lines 21-22) in the form of a wire (col. 4, lines 15-19). A plasma arc (i.e. electrical arc) exists between a first electrode and a second electrode (col. 2, lines 63-67). The arc current utilized to generate the plasma may be as low as 0.5 amps (col. 5, lines 17-18), thus the arc is electrical. It is inherent that the sacrificial (i.e. consumable) wire be present when an electrical arc is generated in order to coat the substrate.

With respect to claim 4, Vukanovic '947 further discloses introducing a coating material into the arc plasma and positioning the substrate material proximate to the arc plasma, whereby said coating material formed by the arc plasma contact the substrate to form the coating (col. 3, lines 8-13), thus the plasma arc is also in contact with the substrate. Furthermore "the arc current utilized to generate the plasma may be as low

as 0.5 amps" (col. 5, lines 17-18), leading to the conclusion that the plasma arc is equivalent to an electrical arc.

With respect to claims 5-7, Vukanovic '947 further discloses suitable coating materials for deposition upon substrates include aluminum, copper, and germanium (col. 4, lines 25-33).

With respect to claims 13-14 and 18-19, Vukanovic '947 further discloses that "the temperature of the plasma jet which emerges from the exit orifice [...] has been measured from 200°C – 700°C" (col. 5, lines 42-44). The exit orifice (part 44) can be seen in figure 3 near arc plasma region (part 16). Figure 4 depicts the arc plasma region adjacent to the substrate (part 43), as also stated (col. 8, lines 28-31). Thus the substrate is in close proximity to the exit orifice with the substrate layers being exposed to an energy source (i.e. the plasma jet heat).

With respect to claim 20, Vukanovic '947 further depicts in figure 3 a magnetic field D.C. source (i.e. electromagnet) (part 35) contains the arc plasma inside the chamber (col. 9, lines 6-9). The plasma produced by the arc reaches several thousand degrees (col. 9, lines 17-18), thus being a form of energy. The carrier gas further transports these species (i.e. arc plasma with coating materials) out exit orifice (part 44) where anything in that vicinity, such as flat substrates may be uniformly coated with the coating material (col. 9, lines 22-27). The plasma that emerges from the exit orifice is a plasma jet (i.e. beam) at a temperature of 200°C – 700°C (col. 5, lines 42-43). As stated earlier, this plasma jet heats the substrate layers to recrystallize them since recrystallized is related to annealing as defined by Wikipedia.com. Therefore the

substrate is annealed since it is heated at a temperature of 700°C and cooled at a temperature of 200°C. Thus the substrate is heated by an electromagnetic energy beam.

With respect to claims 24, 28, 32, and 36 Vukanovic '947 discloses a method for the deposition of coatings upon substrates (i.e. targets) utilizing arc plasma (i.e. electrical arcing) (abstract), where one embodiment of the invention of coated substrates are prepared by establishing electric field conditions in which an arc plasma may exists between a first electrode and a second electrode (col. 2, lines 63-68). Vukanovic '947 further discloses that the coating material may be placed on or in a cathode, where it is vaporized by the heat of the cathode and carried into the plasma region by a carrier gas (col. 4, lines 4-9). Vukanovic '947 describes how the coating materials are introduced into the region of the electrodes in a condensed state, such as a wire and volatized by the heat generated at or on the cathode (col. 4, lines 15-19) and if conductive (i.e. metal) as a sacrificial (i.e. consumable) cathode (col. 4, lines 19-22). An arc plasma is generated by impressing a voltage between the cathode (i.e. first electrode) and anode (i.e. second electrode) (col. 6, lines 66-68). Futhermore, Vukanovic '947 discusses introducing a coating material into the arc plasma and positioning the substrate material proximate to the arc plasma, whereby said coating material formed by the arc plasma contact the substrate to form the coating (col. 3, lines 8-13), thus the plasma arc is also in contact with the substrate. Furthermore "the arc current utilized to generate the plasma may be as low as 0.5 amps" (col. 5, lines 17-18), leading to the conclusion that the plasma arc is equivalent to an electrical arc. An exit

orifice (i.e. nozzle) (figure 3, part 44) forms a jet stream of plasma exiting the chamber (figure 3, part 25). Vukanovic '947 lists suitable coating materials as metals (col. 4, lines 25-33). Vukanovic '947 also describes how the plasma material is introduced into the arc plasma and positioning a substrate material proximate to the arc plasma, whereby said coating material formed by the arc plasma contact the substrate to form a coating (col. 3, lines 8-13). It is well known that for a solid to be vaporized, the solid must transition from a solid state to a liquid state, thus the metal is liquefied.

With respect to claims 26, 30, 34, and 38, Vukanovic '947 further discloses suitable coating materials for deposition upon substrates include aluminum, copper, and germanium (col. 4, lines 25-33).

With respect to claims 27, 31, 35, and 39, Vukanovic '947 further discloses suitable coating materials, including germanium.

With respect to claim 40, Vukanovic '947 further depicts figure 4 with an anode and a cathode (i.e. two electrodes) (parts 11 and 12), where the cathode is a sacrificial cathode (col. 4, lines 21-22) in the form of a wire (col. 4, lines 15-19). A plasma arc (i.e. electrical arc) exists between a first electrode and a second electrode (col. 2, lines 63-67). The arc current utilized to generate the plasma may be as low as 0.5 amps (col. 5, lines 17-18), thus the arc is electrical. It is inherent that the sacrificial (i.e. consumable) wire be present when an electrical arc is generated in order to coat the substrate.

17. Claims 2, 25, 29, 33, and 37 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Vukanovic et al (US Patent No. 4,505,947).

With respect to claims 2, 25, 29, 33, and 37, Vukanovic '947 further discloses that the coating material is deposited onto the surface of the substrate (col. 3, lines 8-13), where the substrate may be a semiconductor (col. 3, lines 14-23). While Vukanovic '947 does not suggest the substrate have depressions or gaps, it is either inherent or obvious that a substrate possess this specified feature as evidenced by Miyazaki (US Patent No. 5,595,938) figures 1-4 and Lee et al (US Patent No. 7,192,335) figures 1 and 2. Furthermore it is well known that a sputter target (i.e. substrate) is eroded unevenly during use, leading to depressions on the target surface.

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. Claims 8-9 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vukanovic et al (US Patent No. 4,505,947) as applied to claims 7 and 12 above.

With respect to claim 8, the reference is cited as discussed for claims 7 and 12. Vukanovic '947 further discloses suitable coating materials for deposition upon substrates include silicon and other semiconductor component or dopant materials including aluminum and copper (col. 4, lines 25-33). However Vukanovic '947 is limited in that while it describes using these three components for the coating materials, it is not suggested as to the specific compositional percentages of these components.

It has been held that differences in concentration or temperature will not support patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Therefore it would have been obvious to one of ordinary skill in the art to use the coating material composition discussed in Vukanovic '947 with various percentage compositions, including those claimed, since one of ordinary skill would expect similar characteristics.

With respect to claim 9, Vukanovic '947 further discloses that the coating material may be placed on or in the cathode (col. 4, lines 4-6), such as a sacrificial cathode (col. 4, lines 21-22), and where the coating materials are introduced into the region of the electrodes in a condensed state, such as a wire (col. 4, lines 15-17). Furthermore Vukanovic '947 states that suitable coating materials include silicon and other semiconductor component or dopant materials, such as aluminum (col. 4, lines 25-29). It is well known that an alloy comprises a mixture of two or more elements with at least one of the elements being a metal. Thus a coating material comprising silicon and aluminum is an aluminum alloy.

With respect to claim 15, Vukanovic '947 further discloses suitable coating materials including aluminum and copper (col. 4, lines 25-33). Vukanovic '947 states that "the temperature of the plasma jet which emerges from the exit orifice [...] has been measured from 200°C – 700°C" (col. 5, lines 42-44). The exit orifice (part 44) can be seen in figure 3 near arc plasma region (part 16). Figure 4 depicts the arc plasma region adjacent to the substrate (part 43), as also stated (col. 8, lines 28-31). Thus the

substrate is in close proximity to the exit orifice with the substrate layers being exposed to an energy source (i.e. the plasma jet heat). However Vukanovic '947 is limited in that while it describes using these components for the coating materials, it is not suggested as to the specific compositional percentages of these components.

It has been held that differences in concentration or temperature will not support patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Therefore it would have been obvious to one of ordinary skill in the art to use the coating material composition discussed in Vukanovic '947 with various percentage compositions, including those claimed, since one of ordinary skill would expect similar characteristics.

20. Claims 10-11 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vukanovic et al (US Patent No. 4,505,947) as applied to claims 7 and 12 above, and further in view of Wu et al (USPGPub 2003/0102207).

With respect to claims 10 and 11, the reference is cited as discussed for claim 7. With respect to claim 10, Vukanovic '947 further discloses suitable coating materials, including germanium. Vukanovic '947 also discloses that the coating material may be placed on or in the cathode (col. 4, lines 4-6), such as a sacrificial cathode (col. 4, lines 21-22), and where the coating materials are introduced into the region of the electrodes in a condensed state, such as a wire (col. 4, lines 15-17). Furthermore Vukanovic '947 states that suitable coating materials include silicon and other semiconductor component or dopant materials, such as aluminum and germanium (col. 4, lines 25-29).

It is well known that an alloy comprises a mixture of two or more elements with at least one of the elements being a metal. Thus a coating material comprised of silicon, aluminum, and germanium is an alloy. However Vukanovic '947 is limited in that while it discusses using a germanium alloy coating, it is not suggested to use a coating of selenium or tellurium

Wu '207 teaches a similar apparatus for providing a chamber for collecting material (i.e. coating a substrate) generated from an electrically conductive starting material selected from a group consisting of a metal alloy, operating a twin-wire arc nozzle and a working gas flow to form an arc between two converging leading tips (i.e. electrodes) and at least partially vaporizing the starting material to provide a stream (i.e. plasma stream), where a gas is injected to direct the stream (abstract). Wu '207 further teaches that the invention is applicable to a number of metals for starting materials, including titanium, tantalum, tungsten, copper (p. 3, para 32), aluminum (p. 3, para 33) germanium (p. 3, para 35), selenium and tellurium (p. 4, para 37). It is known that selenium and tellurium are chalcogens.

Since the prior art of Wu '207 recognizes the equivalency of germanium, selenium, and tellurium in the field of electrical arcing, it would have been obvious to one of ordinary skill in the art to replace germanium of Vukanovic '947 with selenium and tellurium of Wu '207 as it is merely the selection of functionally equivalent chalcogens recognized in the art and one of ordinary skill in the art would have a reasonable expectation of success in making the modification.

With respect to claims 16-17, the reference is cited as discussed for claim 12. Vukanovic '947 further discloses suitable coating materials including silicon and germanium. Vukanovic '947 also discloses that "the temperature of the plasma jet which emerges from the exit orifice [...] has been measured from 200°C – 700°C" (col. 5, lines 42-44). The exit orifice (part 44) can be seen in figure 3 near arc plasma region (part 16). Figure 4 depicts the arc plasma region adjacent to the substrate (part 43), as also stated (col. 8, lines 28-31). Thus the substrate is in close proximity to the exit orifice with the substrate layers being exposed to an energy source (i.e. the plasma jet heat). Furthermore it is well known that the melting point of aluminum (i.e. plurality of metal from claim 12) is below 700°C, thus aluminum melts and forms an interdiffused layer with the other components. However Vukanovic '947 is limited in that while it discusses using a germanium coating, it is not suggested to use a coating of selenium or tellurium.

Wu '207 teaches a similar apparatus for providing a chamber for collecting material (i.e. coating a substrate) generated from an electrically conductive starting material selected from a group consisting of a metal alloy, operating a twin-wire arc nozzle and a working gas flow to form an arc between two converging leading tips (i.e. electrodes) and at least partially vaporizing the starting material to provide a stream (i.e. plasma stream), where a gas is injected to direct the stream (abstract). Wu '207 further teaches that the invention is applicable to a number of metals for starting materials, including titanium, tantalum, tungsten, copper (p. 3, para 32), aluminum (p. 3, para 33) germanium (p. 3, para 35), selenium and tellurium (p. 4, para 37). It is known that selenium and tellurium are chalcogens.

Since the prior art of Wu '207 recognizes the equivalency of germanium, selenium, and tellurium in the field of electrical arcing, it would have been obvious to one of ordinary skill in the art to replace germanium of Vukanovic '947 with selenium and tellurium of Wu '207 as it is merely the selection of functionally equivalent chalcogens recognized in the art and one of ordinary skill in the art would have a reasonable expectation of success in making the modification.

21. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vukanovic et al (US Patent No. 4,505,947) as applied to claim 18 above, and further in view of Lee et al (US Patent No. 7,192,335).

With respect to claims 21-23, Vukanovic '947 is limited in that a process after deposition, such as polishing, is not suggested.

Lee '335 teaches a method for chemically, mechanically, and electrolytically removing material from substrates (abstract) with gaps (figures 1 and 2). Lee '335 discusses a method of engaging the substrate with a polishing pad (i.e. machining) and disposing a polishing liquid (i.e. cleaning solvent) adjacent to the polishing surface, with the polishing liquid containing about 1% abrasive particles (col. 2, lines 25-30). Since the polishing liquid contains a percentage of abrasive particles, the liquid removes some material thus cleaning the surface of the substrate. And since the polishing liquid follows the step of the polishing pad, the polishing liquid removes machining residue. Lee '335 suggests that the polishing liquid be ammonium hydroxide (col. 2, lines 19-26), a well known cleaning solvent. Furthermore, Lee '335 states moving at least one of the polishing pad and the substrate relative to the other to remove material from the

substrate (col. 2, lines 34-37), thus machining the substrate to a predetermined thickness. Lee '335 cites the advantage of polishing as a removal of excess conductive (i.e. copper and aluminum) material (col. 2, lines 51-54).

It would have been obvious to one of ordinary skill in the art to incorporate polishing the substrate as taught in Lee '335 for the method of Vukanovic '947 to gain the advantage of removing excess conductive material from the substrate.

Conclusion

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. USPGPub 2004/0016635; US Patent No. 3,607,067; US Patent No. 5,595,938; US Patent No. 6,337,453; US Patent No. 6,413,387.

23. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

24. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER